MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2019/2020

HHG1011 – BASIC HUMAN GENETICS

(All section / Groups)

12 MARCH 2020
2:30 pm – 4:30 pm
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of **6** printed pages including the cover page with **5** questions only.
2. Attempt all **FIVE** questions. All questions carry equal marks and the distribution of the marks for each question is given.
3. Please write all your answers in the **Answer Booklet** provided.

QUESTION 1

A. Name ONE of the genetic element that contain DNA but cannot exist independently. [0.5 mark]

B. In a healthy male, how many sperm cells would be expected to be formed from (i) 400 primary spermatocytes? (ii) 400 secondary spermatocytes? [1 mark]

C. "When the mitotic cell is increasing the cell number during initial stages of human embryogenesis." Define this statement using a term. [0.5 mark]

D. When does the embryonic development occurs? [1 mark]

E. Hemoglobin switching involves changes in production of the globin chains at specific times during human development. During embryonic development, what globin proteins are produced? [1 mark]

F. Give TWO evidence that suggests aging has a genetic basis. [2 marks]

G. The genetic code is fairly consistent among all organisms. What is the term often used to describe such consistency in the code? [0.5 mark]

H. What are THREE post-transcriptional modifications often seen in the maturation of mRNA in eukaryotes? [1.5 marks]

I. Name any TWO approaches of gene therapy. Distinguish these approaches based on how they are administered. [2 marks]

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QUESTION 2

A. Type I diabetics caused by the destruction of the pancreatic beta cells. Briefly explain THREE conditions of an individual who suffers from type I diabetic. [1.5 marks]

B. What are the TWO main risk factors for individual developing an asthma? [1 mark]

C. What are the main functions of low-density lipoprotein cholesterol (LDL-C) and high-density lipoprotein cholesterol (HDL-C) in the body? [2 marks]

D. Why do drug responses vary in individual? [0.5 mark]

E. In the polymerase chain reaction, what is the purpose of the initial high temperature? What is the purpose of cooling in the second step? [2 marks]

F. Name the process that can copy target DNA into RNA and then uses RNA polymerase to amplify RNA? Give ONE advantage of this process. [2 marks]

G. In the context of recombinant DNA technology, what is meant by the term transgenic animal? [1 mark]

Continued...

QUESTION 3

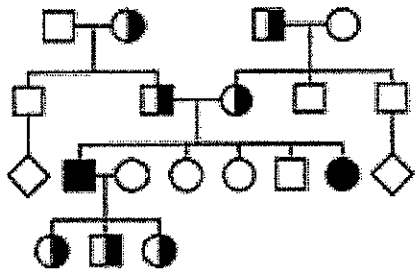
A. What gender is an XXY chromosome? Name the specific term for those who carry this type of chromosome. [1 mark]

B. John is color-blind and has a maternal grandfather who was color blind. His mother and father are phenotypically normal. What kind of genetic attributes John being color blind? [0.5 mark]

C. What types of phenotypic ratio are likely to occur in crosses when dealing with a single gene pair? [1.5 marks]

D. Apply the product law to a coin-flip situation. What is the probability that on three flips of a coin, heads will occur on all three flips? [0.5 mark]

E. What is the pattern of inheritance for the pedigree below?



[1 mark]

F. If a father has X-linked dominant inheritance features, does he pass to all his sons and daughters? [1 mark]

G. What is X-inactivation? [1 mark]

H. Why X-inactivation process is important? [1 mark]

I. What are the consequences of X inactivation in females? Give ONE. [1 mark]

J. Quantitative inheritance involves the interaction of a number of gene loci. What is the pattern of genetic transmission typical of quantitative inheritance? Give TWO example of this pattern of inheritance. [1.5 marks]

Continued...

QUESTION 4

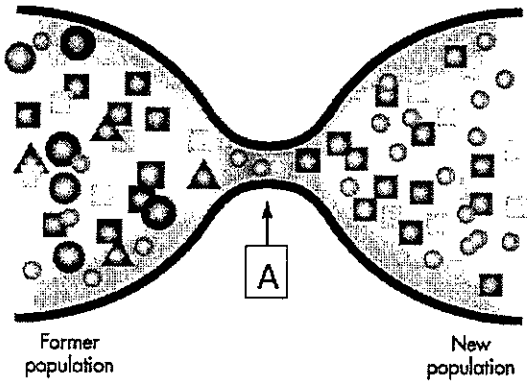
A. How is the frequency of heterozygotes for a given allelic pair presented in the Hardy-Weinberg equilibrium? [0.5 mark]

B. Human beings carrying the dominant allele D have normal finger length and d have short middle finger. In a population with the frequency of dominant allele is 0.4, estimate the probability that a particular individual is heterozygotes. [3 marks]

C. What term is given to the total genetic information carried by all members of a population? [0.5 mark]

D. In small isolated populations, gene frequencies can fluctuate considerably. What is the best term that applies to this circumstance? [0.5 mark]

E. What is the best term that applies to [A] in the diagram below based on the genetic populations?



[0.5 mark]

F. What information does genetic counselor provide to individuals, couples expecting children, and families? [1.5 marks]

G. Name THREE tests that can be performed on fetal cells to confirm birth defect. [1.5 marks]

H. What is genetic cancer testing? What does the test for/investigate? [2 marks]

Continued...

QUESTION 5

A. Under certain conditions, the rate of mutation of a particular gene may be determined in humans. What properties of the mutation would favor the most direct determination of mutation rate in humans? Give THREE. [1.5 marks]

B. Cystic fibrosis transmembrane conductance regulator (CFTR) is a chloride transporter found in the membrane of epithelial cells. What happen if mutations occurred in this transmembrane conductance regulator.

[2 marks]

C. Which type of mutation does not give an impact on protein function but creates a nonsynonymous codon? How this can happen? [1 mark]

D. List THREE classes of environmental agents that are known to cause the conversion of proto-oncogenes to oncogenes. [1.5 marks]

E. Describe the cellular and molecular function of the *ras* gene family and the consequences of mutations in *ras*. [2 marks]

F. Cancer is genetic, but is not usually inherited. Based on the statement, which type of cancer is best referred to? Briefly explain, how does this type of cancer form?

[2 marks]

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